CLAIMS

What is claimed is:

1. A system for simulating a disease control parameter such that a future disease control parameter value $X(t_j)$ at time t_j is determined from a prior disease control parameter value $X(t_i)$ at time t_i based on an optimal control parameter value $R(t_j)$ at time t_j, the difference between said prior disease control parameter value $X(t_i)$ and an optimal control parameter value $R(t_i)$ at time t_i, and a set of differentials between patient self-care parameters having patient self-care values $S_M(t_i)$ at time t_i and optimal self-care parameters having optimal self-care values $O_M(t_i)$ at time t_i, said differentials being multiplied by corresponding scaling factors K_M, said system comprising:
   a) an input means for entering said patient self-care values $S_M(t_i)$;
   b) a memory means for storing said optimal control parameter values $R(t_i)$ and $R(t_j)$, said prior disease control parameter value $X(t_i)$, said optimal self-care values $O_M(t_i)$, and said scaling factors K_M;
   c) a processor means in communication with said input means and said memory means for calculating said future disease control parameter value $X(t_j)$; and
   d) a display means for displaying said future disease control parameter value $X(t_j)$.

2. The system of claim 1, wherein said processor means calculates said future disease control parameter value $X(t_j)$ according to the equation:

$$X(t_j) = R(t_j) + (X(t_i)-R(t_i)) + \sum_M K_M(S_M(t_i)-O_M(t_i)).$$

3. The system of claim 1, further comprising a recording means in communication with said processor means for recording an actual control parameter value $A(t_i)$ at time t_i, an actual control parameter value $A(t_j)$ at time t_j, and actual self-care parameters having actual self-care values $C_M(t_i)$ at time t_i, and wherein said processor means further comprises means for adjusting said scaling factors K_M based on the difference between said actual control parameter value $A(t_j)$ and said optimal control parameter value $R(t_j)$, the difference between said actual control parameter value $A(t_i)$ and said optimal control parameter value $R(t_i)$, and the difference between said actual self-care values $C_M(t_i)$ and said optimal self-care values $O_M(t_i)$.

4. The system of claim 3, wherein said recording means comprises a measuring means for producing measurements of said actual control parameter values $A(t_i)$ and $A(t_j)$.

5. The system of claim 1, wherein said input means further comprises means for entering a value of a physiological parameter of a patient and said processor means further comprises means for determining at least one of said scaling factors from said value of said physiological parameter.

6. The system of claim 5, wherein said physiological parameter is selected from the group consisting of a body mass, an insulin sensitivity, a metabolism rate, and a fitness level.

7. The system of claim 1, wherein said disease control parameter comprises a blood glucose level.

8. The system of claim 7, wherein at least one of said patient self-care parameters is selected from the group consisting of a food exchange, an insulin dose, and an exercise duration.

9. The system of claim 1, wherein said input means, said memory means, and said processor means are operated on a stand-alone computing device.

10. The system of claim 1, wherein said input means, said memory means, and said processor means are operated on a plurality of computers communicating over a network.

11. The system of claim 1, wherein said input means, said memory means, and said processor means comprise a patient multi-media processor and a healthcare provider computer communicating with said patient multi-media processor via a smart card.

12. A system for predicting an effect of patient self-care actions on a disease control parameter such that a future disease control parameter value $X(t_j)$ at time t_j is determined from an actual disease control parameter value $A(t_i)$ at time t_i based on an optimal control parameter value $R(t_j)$ at time t_j, the difference between said actual disease control parameter value $A(t_i)$ and an optimal control parameter value $R(t_i)$ at time t_i, and a set of differentials between patient self-care parameters having patient self-care values $S_M(t_i)$ at time t_i and optimal self-care parameters having optimal self-care values $O_M(t_i)$ at time t_i, said differentials being multiplied by corresponding scaling factors K_M, said system comprising:

a) an input means for entering said actual disease control parameter value $A(t_i)$ and said patient self-care values $S_M(t_i)$;

b) a memory means for storing said optimal control parameter values $R(t_i)$ and $R(t_j)$, said optimal self-care values $O_M(t_i)$, and said scaling factors K_M;

c) a processor means in communication with said input means and said memory means for calculating said future disease control parameter value $X(t_j)$; and

d) a display means for displaying said future disease control parameter value $X(t_j)$.

13. The system of claim 12, wherein said processor means calculates said future disease control parameter value $X(t_j)$ according to the equation:

$$X(t_j) = R(t_j) + (A(t_i)-R(t_i)) + \sum_M K_M(S_M(t_i)-O_M(t_i)).$$

14. The system of claim 12, wherein said input means further comprises means for entering an actual control parameter value $A(t_j)$ at time t_j and actual self-care parameters having actual self-care values $C_M(t_i)$ at time t_i, and wherein said processor means further comprises means for adjusting said scaling factors K_M based on the difference between said actual control parameter value $A(t_j)$ and said optimal control parameter value $R(t_j)$, the difference between said actual control parameter value $A(t_i)$ and said optimal control parameter value $R(t_i)$, and the difference between said actual self-care values $C_M(t_i)$ and said optimal self-care values $O_M(t_i)$.

15. The system of claim 14, further comprising a measuring means connected to said input means for

producing measurements of said actual control parameter values $A(t_i)$ and $A(t_j)$.

16. The system of claim 12, wherein said input means further comprises means for entering a value of a physiological parameter of a patient and said processor means further comprises means for determining at least one of said scaling factors from said value of said physiological parameter.

17. The system of claim 16, wherein said physiological parameter is selected from the group consisting of a body mass, an insulin sensitivity, a metabolism rate, and a fitness level.

18. The system of claim 12, wherein said disease control parameter comprises a blood glucose level.

19. The system of claim 18, wherein at least one of said patient self-care parameters is selected from the group consisting of a food exchange, an insulin dose, and an exercise duration.

20. The system of claim 12, wherein said input means, said memory means, and said processor means are operated on a stand-alone computing device.

21. The system of claim 12, wherein said input means, said memory means, and said processor means are operated on a plurality of computers communicating over a network.

22. The system of claim 12, wherein said input means, said memory means, and said processor means comprise a patient multi-media processor and a healthcare

provider computer communicating with said patient multi-media processor via a smart card.

23. A method for simulating a disease control parameter in a simulation system such that a future disease control parameter value $X(t_j)$ at time t_j is determined from a prior disease control parameter value $X(t_i)$ at time t_i based on an optimal control parameter value $R(t_j)$ at time t_j, the difference between said prior disease control parameter value $X(t_i)$ and an optimal control parameter value $R(t_i)$ at time t_i, and a set of differentials between patient self-care parameters having patient self-care values $S_M(t_i)$ at time t_i and optimal self-care parameters having optimal self-care values $O_M(t_i)$ at time t_i, said differentials being multiplied by corresponding scaling factors K_M, said simulation system comprising a memory, a processor connected to said memory, a display connected to said processor, and an input means for entering in said processor said patient self-care values $S_M(t_i)$, said method comprising the following steps:

a) storing in said memory said optimal control parameter values $R(t_i)$ and $R(t_j)$, said prior disease control parameter value $X(t_i)$, said optimal self-care values $O_M(t_i)$, and said scaling factors K_M;

b) entering in said processor said patient self-care values $S_M(t_i)$;

c) calculating in said processor said future disease control parameter value $X(t_j)$; and

d) displaying said future disease control parameter value $X(t_j)$ on said display.

24. The method of claim 23, wherein said future disease control parameter value $X(t_j)$ is calculated according to the equation:

$$X(t_j) = R(t_j) + (X(t_i)-R(t_i)) + \sum_M K_M(S_M(t_i)-O_M(t_i)).$$

25. The method of claim 23, further comprising the steps of recording an actual control parameter value $A(t_i)$ at time t_i, an actual control parameter value $A(t_j)$ at time t_j, and actual self-care parameters having actual self-care values $C_M(t_i)$ at time t_i and adjusting said scaling factors K_M based on the difference between said actual control parameter value $A(t_j)$ and said optimal control parameter value $R(t_j)$, the difference between said actual control parameter value $A(t_i)$ and said optimal control parameter value $R(t_i)$, and the difference between said actual self-care values $C_M(t_i)$ and said optimal self-care values $O_M(t_i)$.

26. The method of claim 23, further comprising the steps of determining a value of a physiological parameter of a patient and determining at least one of said scaling factors from said value of said physiological parameter.

27. The method of claim 26, wherein said physiological parameter is selected from the group consisting of a body mass, an insulin sensitivity, a metabolism rate, and a fitness level.

28. The method of claim 23, wherein said disease control parameter comprises a blood glucose level.

29. The method of claim 28, wherein at least one of said patient self-care parameters is selected from the group consisting of a food exchange, an insulin dose, and an exercise duration.

30. A method for predicting in a simulation system an effect of patient self-care actions on a disease control parameter such that a future disease control parameter value $X(t_j)$ at time t_j is determined from an actual disease control parameter value $A(t_i)$ at time t_i based on an optimal control parameter value $R(t_j)$ at time t_j, the difference between said actual disease control parameter value $A(t_i)$ and an optimal control parameter value $R(t_i)$ at time t_i, and a set of differentials between patient self-care parameters having patient self-care values $S_M(t_i)$ at time t_i and optimal self-care parameters having optimal self-care values $O_M(t_i)$ at time t_i, said differentials being multiplied by corresponding scaling factors K_M, said simulation system comprising a memory, a processor connected to said memory, a display connected to said processor, and an input means for entering in said processor said actual disease control parameter value $A(t_i)$ and said patient self-care values $S_M(t_i)$, said method comprising the following steps:

a) storing in said memory said optimal control parameter values $R(t_i)$ and $R(t_j)$, said optimal self-care values $O_M(t_i)$, and said scaling factors K_M;

b) entering in said processor said actual disease control parameter value $A(t_i)$ and said patient self-care values $S_M(t_i)$;

c) calculating in said processor said future disease control parameter value $X(t_j)$; and

d) displaying said future disease control parameter value $X(t_j)$ on said display.

31. The method of claim 30, wherein said future disease control parameter value $X(t_j)$ is calculated according to the equation:

$$X(t_j) = R(t_j) + (A(t_i)-R(t_i)) + \sum_M K_M(S_M(t_i)-O_M(t_i)).$$

32. The method of claim 30, further comprising the steps of entering in said processor an actual control parameter value $A(t_j)$ at time t_j and actual self-care parameters having actual self-care values $C_M(t_i)$ at time t_i and adjusting said scaling factors K_M based on the difference between said actual control parameter value $A(t_j)$ and said optimal control parameter value $R(t_j)$, the difference between said actual control parameter value $A(t_i)$ and said optimal control parameter value $R(t_i)$, and the difference between said actual self-care values $C_M(t_i)$ and said optimal self-care values $O_M(t_i)$.

33. The method of claim 30, further comprising the steps of determining a value of a physiological parameter of a patient and determining at least one of said scaling factors from said value of said physiological parameter.

34. The method of claim 33, wherein said physiological parameter is selected from the group consisting of a body mass, an insulin sensitivity, a metabolism rate, and a fitness level.

35. The method of claim 30, wherein said disease control parameter comprises a blood glucose level.

36. The method of claim 35, wherein at least one of said patient self-care parameters is selected from the group consisting of a food exchange, an insulin dose, and an exercise duration.